DOCUMENT RESUME

ED 122 220 CS 002 575

AUTHOR Walton, Howard N.; And Others
TITLE Comparison of Vision Screening by the Modified Telebinocular Technique and the Modified Clinical Technique.
PUB DATE 76
NOTE 19p.; Paper presented at the Annual Meeting of the International Reading Association (21st, Anaheim, California, May 1976); Not available in hard copy due to marginal legibility of original document

EDRS PRICE MF-$0.83 Plus Postage. HC Not Available from EDRS.
DESCRIPTORS Comparative Analysis; Elementary Education; *Pupil Personnel Services; Vision; *Vision Tests; Visual Acuity; Visual Perception
IDENTIFIERS MCT; Modified Clinical Technique; *Modified Telebinocular Technique; MTT

ABSTRACT

This paper reports an investigation of the effectiveness of vision screening by the Modified Telebinocular Technique (MTT) when compared to the more cumbersome but highly valid and reliable Modified Clinical Technique (MCT). Data on 102 school children were collected using the MCT. The same children were then given the MTT to establish comparison data for the various visual anomalies that can be detected by the MCT. The data showed an agreement of 89.2 percent between the two tests (75.5 percent agreement on the number of passes, 13.7 percent agreement on failures, and 10.8 percent were mutually ambiguous). A statistical analysis of the data demonstrated a significance of greater than the .01 percent level of confidence, indicating that the MTT vision screening procedure will provide results which are comparable to the MCT. (Author/JM)

****
* Documents acquired by ERIC include many informal unpublished *
* materials not available from other sources. ERIC makes every effort *
* to obtain the best copy available. Nevertheless, items of marginal *
* reproducibility are often encountered and this affects the quality *
* of the microfiche and hardcopy reproductions ERIC makes available *
* via the ERIC Document Reproduction Service (EDRS). EDRS is not *
* responsible for the quality of the original document. Reproductions *
* supplied by EDRS are the best that can be made from the original. *
****

ED122220

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

Howard N. Walton
So. Calif. Col. of Optometry
2001 Associated Road
Fullerton, Calif. 92631

COMPARISON OF VISION SCREENING by THE MODIFIED TELEBINOCULAR TECHNIQUE and THE MODIFIED CLINICAL TECHNIQUE

Wednesday, May 12--3:45-4:45
Magnolia C

"PERMISSION TO REPRODUCE THIS COPYRIGHTED MATERIAL BY MICROFICHE ONLY HAS BEEN GRANTED BY
Howard N. Walton
Michael Zirhut
TO ERIC AND ORGANIZATIONS OPERATING UNDER AGREEMENTS WITH THE NATIONAL INSTITUTE OF EDUCATION FURTHER REPRODUCTION OUTSIDE THE ERIC SYSTEM REQUIRES PERMISSION OF THE COPYRIGHT OWNER"

"PERMISSION TO REPRODUCE THIS COPYRIGHTED MATERIAL BY MICROFICHE ONLY HAS BEEN GRANTED BY
Barbara Armstrong
TO ERIC AND ORGANIZATIONS OPERATING UNDER AGREEMENTS WITH THE NATIONAL INSTITUTE OF EDUCATION FURTHER REPRODUCTION OUTSIDE THE ERIC SYSTEM REQUIRES PERMISSION OF THE COPYRIGHT OWNER"

By

Howard N. Walton*
Southern Cslif. College of Optometry, Fullerton, Cal.
Cal-State University, Fullerton, Cal.

Michael Zirhut**

Barbara Armstrong**

*Optometrist, M.S., Member of Faculty, Fellow American Academy of Optometry

**Senior Optometry Student

05 002 575

BEST AVAILABLE COPY

ABSTRACT

An investigation as to the effectiveness of vision screening by the Modified Telebinocular Technique when compared to the more cumbersome but highly valid and reliable Modified Clinical Technique. Data on 102 school children were collected using the M.C.T.; then the same children were given the M.T.T. to establish comparison data for the various visual anomalies that can be detected by the M.C.T.

The data showed an agreement of 89.2% between the two tests (75.5% agreement on the number of passes, 13.7% agreement on failures and 10.8% were mutually ambiguous.)

A statistical analysis of the data demonstrated a significance of greater than the .01% level of confidence indicating the M.T.T. vision screening procedure will provide results which are comparable to the M.C.T.

INTRODUCTION

At present the only method of vision screening used in schools that is acceptable to optometrists and ophthalmologists is the Modified Clinical Technique (henceforth to be referred to as the MCT). This technique has been shown to be the most effective having the highest percentage of correct referrals (98%) and the lowest percentage of underreferrals (2%)--(Orinda Study.)(1)

However, the MCT has one major drawback making it an impractical procedure for use in the school systems. The screening involves retinoscopy, a sophisticated technique requiring years of practice in order to be able to obtain accurate results. Consequently the screening must be performed either by optometrists, ophthalmologists or senior clinicians from professional schools. Unfortunately these professional people are seldom available for school screenings because they are busy with their private practices and the remuneration offered by the school systems is insufficient. Consequently the MCT method of screening is seldom used except in school systems near professional colleges and universities. Under these circumstances the public or private school contracts for the senior clinicians to provide the screening service under the supervision of a licensed practitioner who is a staff member of the professional school.

Presently, instead of using the MCT for screening, most schools have nurses screen children with a Snellen Chart.

The Snellen Chart (Table I) is an ineffective screening device. While it may detect severe astigmatism and severe hyperopia, it basically only screens for amblyopia and myopia (which is usually associated with better than average reading and school performance.) Unfortunately it misses all of the motor problems and most of the sensory problems associated with visual handicaps, academic underachievement and learning disabilities.

TABLE I

EFFECTIVENESS OF SCREENING PROCEDURES

Snellen Chart	Modified Telebinocular Technique	Modified Clinical Technique
I Sensory	I. Sensory	I. Sensory
1. Myopia	1. Myopia	1. Myopia
2. Amblyopia	2. Hyperopia	2. Hyperopia
3. Severe Astigmatism	a. low	a. low
4. Severe Hyperopia	b. moderate	b. moderate
	c. high	c. high
	3. Astigmatism	3. Astigmatism
	a. low	a. low
	b. moderate	b. moderate
	c. high	c. high
	4. Myopic astigmatism	4. Myopic astigmatism
	a. low	a. low
	b. moderate	b. moderate
	c. high	c. high
	5. Hyperopic astigmatism	5. HyperopicAstigmatism
	a. low	a. low
	b. moderate	b. moderate
	c. high	c. high
	6. Stereopsis	6. Not included
	7. Color Perception	7. Not included
	8. Fusion	8. Fusion
	a. far	a. far
	b. near	b. near
	9. Suppression	9. Suppression
	10. Anisometropia	10. Anisometropia
	11. Amblyopia	11. Amblyopia
	II. Motor	II. Motor
	1. Lateral and Vertical Phorias (Muscle imbalances)	1. Lateral and Vertical Phorias (Muscle imbalances)
	a. Far	a. Far
	b. Near	b. Near
	2. Lateral and Vertical Tropias (deviation of the eyes)	2. Lateral and Vertical Tropias (deviation of the eyes)
	a. Far	a. Far
	b. Near	b. Near

STATEMENT OF THE PROBLEM

An alternate vision screening method is needed which can be easily administered by school nurses, teachers, psychologists and technicians providing the same efficiency as the M.C.T.

To meet this need the Modified Telebinocular Technique (M.T.T.) has been developed. The M.T.T. can detect all visual problems screened by the M.C.T. and also tests for color perception. The Walton card, basic to the M.T.T. battery was developed by Dr. Howard Walton and researched by Jennings and Yost.(2) It was shown to be valid and reliable for screening myopia and astigmatism of .75D or more. Eye pathology detection is not part of the screening as it is relatively uncommon among children approximately 1% (3) and is usually noted and handled by school nurses with the observational help of classroom teachers.

The purpose of the study is to determine in a school screening situation if the M.T.T. is as efficient as the M.C.T. in detecting visual problems.

SUBJECTS

The 102 school children in the study were selected at random and ranged from grade one to grade seven. Twenty-five subjects came from a local public school and the remaining seventy-seven were from a parochial school. There was an equal number of boys (51) and girls (51).

INSTRUMENTATION AND EQUIPMENT

The following instruments and equipment were used:

1. Keystone school telebinoculars
2. Keystone Visual Skills cards as follows:
   1. Standard cards--Simultaneous Perception, fusion, vertical and lateral eye posture, stereopsis and color vision.
   2. Usable vision cards $4\frac{1}{2}$, 5 and 6 with +1.50 diopter lenses.
   3. Walton Card--developed to screen specific vision problems (Table II)

<u>Near</u>

1. Standard cards--fusion and lateral eye posture.

TABLE II

METHOD OF DETECTING VISUAL PROBLEMS

VISUAL ANOMALY	M.C.T.	M.T.T.
Visual Acuity	Tumbling E	Walton Card
Myopia	Retinoscopy	" "
Hyperopia	"	+1.50 diopter lenses/ Cards $4\frac{1}{2}$, 5 & 6
Astigmatism	"	Walton card
Anisometropia	"	" "
Tropia	Disposition Table	Simultaneous perception, fusion & stereopsis cards
Muscle Imbalance	" "	Phoria and fusion cards
Color Perception	Not included	Color card

PROCEDURE

The M.C.T. screening was done by professional optometrists and clinicians with the data being recorded on school screening cards. The following four stations were required:

1. Retinoscopy
2. Visual Acuity
3. Ophthalmoscopy
4. Motor problems

The disposition table is also located at station four where the subject is either passed, retested or referred.

The M.T.T. consists of one station and a clinician or trained school personnel for administration. In the study two telebinoculars were used to meet scheduling.

All children were administered the M.C.T. with the M.T.T. screening following. The results were not reviewed until both procedures were completed, thus providing a double bind study. The referral criteria is shown in Table III.

TABLE III

CRITERION FOR FAILURE

Visual Anomaly	M.C.T.	M.T.T.
Visual Acuity	Grades 1-3/20/30 or poorer Tumbling E	Grades 1-3,4 or more of 7 20/40 letters
	Grades 4-7; 20/25 or poorer Tumbling E	Grades 4-7,4 or more of 7 20/30 letters
Myopia	-0.50 D or more	"
Astigmatism	Difference 0.75 D or more between meridians	"
Hyperopia	+1.50 D or more	Locates dot #10 through +1.50 lenses (If hyperopic eye is amblyopic, it will show up on acuity test.)
Anisometropia	Difference 0.75 or more between eyes.	5 or more spaces apart between eyes on cards 5 & 6. (myopic anisometropes fails acuity test)
Strabismus	Movement on unilateral cover test	Fails simultaneous perception, stereopsis (all lines) and or phoria and fusion cards.
Muscle Imbalance	10 exo or more, 6 eso or more, 2 hyper or more on alternate cover test (Far and Near)	Fails both the phoria and fusion cards
Color Vision	Not included	Fails color cards

RESULTS

The data collected from 102 school children ranging from the first through the seventh grades shows agreement between the two screening techniques on 91 of the 102 subjects (TableIV). This is an agreement of 89.2% (Table V). The distribution of passes and failures is shown in Table VI.

In Table VI section D, the failures were due to 1. acuity and astigmatism, 2. myopia, 3. overconvergence, and 4. hyperopia. In the first case the amount of astigmatism found by retinoscopy is 2.50D in the right and 3.25D in the left eye. This would of course cause a failure in the 20/30 Tumbling E (a second grade child). However, with the M.T.T. the child passed the acuity test (Walton card) to the 20/25 line. If the retinoscopy were correct, this would not be possible, as the Walton card letters are designed to confuse astigmats. In this case the M.T.T. appears to be more accurate.

The second case the M.C.T. failure was due to myopia of 1.00D. However, the child passed the M.C.T. acuity test of 20/25 E (6th grader). Therefore, again the retinoscopy appears to be faulty rather than the acuity findings by either technique.

The third case (failure) is due to overconvergence, the subject shows an esophoria of greater than 6 prism diopters at distance and near. The M.T.T. shows a borderline esophoria with the patient failing the phoria test but passing the fusion test indicating the reserve is adequate to compensate for the

phoria. However, M.T.T. muscle balance failure criteria requires failure on both cards to avoid overreferrals. Thus, the M.T.T. would probably more accurately relate to a clinical office finding.

The fourth case where failure is due to hyperopia is probably a correct retinoscopy finding as it is considerably more difficult to find more plus than truly exists. The child possibly passed the hyperopia test in the M.T.T. due to a momentary accomodative effort blurring the last signposts.

In Table VI, section A, four of the M.T.T. failures were due to hyperopia. In these cases the M.T.T. appears more accurate because it is unlikely that a subject could see the dot in signpost #10 without being 1.50 diopters hyperopic. However it must be recognized that a depth of focus of maximum of +0.37D might allow a +1.12 hyperope to fail the test. This could be remedied by using +1.87 D lenses. In 3 of the 4 cases above the retinoscopy was significantly removed from +1.50 and therefore the depth of focus did not account for the difference. However, the M.C.T. method of retinoscopy does account for the error as a television screen at a distance of 20 feet is used as a fixation target. Pheiffer (4) has shown that subjects will use accommodation to view the TV screen if the information is interesting to the observer. This decreases the amount of hyperopia detected by retinoscopy. This is not true of the M.T.T. as the railroad scene offers a minimal stimulus to accomodation.

The last three failures in section A were due to Walton Card (acuity) failures. These failures are probably astigmats

not picked up with retinoscopy. They can easily pass the tumbling E test as the E is frequently oriented along the non-astigmatic meridians. However, these subjects fail the Walton card because the letters are specifically designed to confuse astigmats.

Of the fourteen failures, Table VI, Section C, 11 agreed exactly as to the reason for failure. (2 astigmats, 1 muscle imbalance, 1 strabismus, 2 hyperopes and 5 myopes). Of the three that did not agree, two of the M.C.T. failures were due to overconvergence. Whereas, their respective M.T.T. failures were due to anisometropia and strabismus. However, hyperopia does cause an increased accomodative effort which often results in overconvergence or strabismus. The strabismus and phoria findings are related and therefore could be considered similar findings. The third failure disagreement consists of an M.C.T. anisometropia and an M.T.T. muscle imbalance.

The analysis seems to indicate that Section C consists of 12 agreements and 2 disagreements.

The statistical analysis of the distribution (Table VI) shows a significance greater than the .01 level of confidence and a detailed evaluation of the ambiguities indicates the M.T.T. is probably more accurate.

TABLE IV

COMPARISON OF VISION SCREENING BY MTT AND MCT

SUBJECTS AND GRADES SCREENED

N= 102

Grade	Pass		Fail		Ambiguous		Total
Level	Male	Female	Male	Female	Male	Female	
First	1	1	1	1	0	1	5
Second	3	2	0	1	1	1	8
Third	13	15	1	3	0	2	34
Fourth	0	1	0	0	0	0	1
Fifth	13	12	1	0	2	1	20
Sixth	9	6	3	3	2	1	24
Seventh	0	1	0	0	0	0	1
Sub Totals	39	38	6	8	5	6	102
Totals	77		14		11		102

****

TABLE V

PERCENTAGE ANALYSIS

Classification	NO.	Percentage Sub-total	Total
Passed (by both screening procedures)	77	75.5	
Failed (by both screening procedures)	14	13.7	
Total (agreement by both procedures)	91		89.2
Ambiguous (screening results inconsistent)	11		10.8

TABLE VI

COMPARISON OF VISION SCREENING BY MTT & MCT

PHI - COEFFICIENT OF CORRELATION

Distribution

A. MTT - Fail MCT-Pass 7	B. MTT-Pass MCT-pass 77
C. MTT-Fail MCT-Fail 14	D. MTT-Pass MCT-Fail 4

$$\text{Phi} = \frac{BC - AD}{\sqrt{(A+B)\,(C+D)\,(A+C)\,(B+D)}}$$

Phi = .525

I^a (Chi-square) = $N\phi^a$

I^a = 28.11 (.01 = 6.6349)

Significance > .01 level

CONCLUSIONS

A statistical analysis of the M.T.T. and M.C.T. shows a significance of greater than the .01 level of confidence indicating the M.T.T. screening procedure will provide results which are comparable to the M.C.T.

A reliable method of screening is now available in school districts where professional help is unavailable as the vision screening may be administered by trained and qualified school personnel.

Vision problems resulting in academic handicaps, academic underachievement and learning disabilities may now be accurately screened by school districts.

The Snellen chart should be discontinued because:

1. It is ineffective and unreliable.
2. Deceptive--school nurses, teachers and parents usually believe the child has "perfect vision" if the Snellen Test is passed.

REFERENCES

1. Blum, Henrik L., Henry B. Peters, Jerome W. Bettman. "The Orinda Study", University of California Press, 1959; 115.

2. Jennings, John J. and Paul F. Yost. "Verification of Walton Card." Unpublished thesis, Southern Calif. College of Optometry, 1975.

3. Blum, Henrik L., Henry B. Peters, Jerome W. Bettman. "The Orinda Study", University of California Press, 1959; 79.

4. Pheiffer, C.H., "Television Retinoscopy," Am. J. Optom. and Arch. Am. Acad. Optom., 32 (11): 595-598, 1955.